What is claimed is:

1. A method of reducing the permeability of a subterranean formation to aqueous-based fluids during the drilling phase comprising the steps of:

providing a water-soluble relative permeability modifier that comprises a hydrophobically modified polymer, wherein the hydrophobically modified polymer comprises a polymer backbone that comprises polar heteroatoms, and

placing the water-soluble relative permeability modifier into the subterranean formation during the drilling phase.

2. The method of claim 1 wherein the hydrophobically modified polymer has a molecular weight in the range of from about 100,000 to about 10,000,000.

3. The method of claim 1 wherein the polar heteroatoms comprise oxygen, nitrogen, sulfur, or phosphorous.

4. The method of claim 1 wherein the hydrophobically modified polymer is a reaction product of a hydrophobic compound and a hydrophilic polymer that comprises a polymer backbone comprising polar heteroatoms.

5. The method of claim 4 wherein the hydrophilic polymer comprises a cellulose, a chitosan, a polyamide, a polyetheramine, a polyethyleneimine, a polyhydroxyetheramine, a polylysine, a polysulfone, or a starch.

6. The method of claim 4 wherein the hydrophobic compound comprises an alkyl halide, a sulfonate, a sulfate, or an organic acid derivative.

7. The method of claim 6 wherein the organic acid derivative comprises an octenyl succinic acid; a dodecenyl succinic acid; or an anhydride, ester, or amide of octenyl succinic acid or dodecenyl succinic acid.

8. The method of claim 4 wherein the hydrophobic compound has an alkyl chain length of from about 4 to about 22 carbons.

9. The method of claim 1 wherein the water-soluble relative permeability modifier is placed into the subterranean formation in a drilling fluid that comprises the water-soluble relative permeability modifier.

10. The method of claim 9 wherein the water-soluble relative permeability modifier is present in the drilling fluid in an amount in the range of from about 0.02% to about 3% by weight of the drilling fluid.

11. A method of reducing the permeability of a subterranean formation to aqueous-based fluids during the drilling phase comprising the steps of:

providing a water soluble relative permeability modifier that comprises a hydrophobically modified polymer, wherein the hydrophobically modified polymer is a reaction product of:

a hydrophilic polymer that comprises a polyvinylamine, a poly(vinylamine/vinyl alcohol), or an alkyl acrylate polymer, and

a hydrophobic compound; and

placing the water-soluble relative permeability modifier into the subterranean formation during the drilling phase.

12. The method of claim 11 wherein the hydrophobically modified polymer has a molecular weight in the range of from about 100,000 to about 10,000,000.

13. The method of claim 11 wherein the alkyl acrylate polymer comprises polydimethylaminoethyl methacrylate, polydimethylaminopropyl methacrylamide, poly(acrylamide/dimethylaminoethyl methacrylate), poly(acrylic acid/dimethylaminoethyl methacrylate), poly(methacrylic acid/dimethylaminoethyl methacrylate), poly(2-acrylamido-2-methyl propane sulfonic acid/dimethylaminoethyl methacrylate), poly(acrylamide/dimethylaminopropyl methacrylamide), poly(acrylic acid/dimethylaminopropyl methacrylamide), or poly(methacrylic acid/dimethylaminopropyl methacrylamide).

14. The method of claim 11 wherein the hydrophobic compound comprises an alkyl halide, a sulfonate, a sulfate, or an organic acid derivative.

15. The method of claim 14 wherein the organic acid derivative comprises an octenyl succinic acid; a dodecenyl succinic acid; or an anhydride, ester, or amide of octenyl succinic acid or dodecenyl succinic acid.

16. The method of claim 11 wherein the hydrophobic compound has an alkyl chain length of from about 4 to about 22 carbons.

17. The method of claim 11 wherein the water-soluble relative permeability modifier is placed into the subterranean formation in a drilling fluid that comprises the water-soluble relative permeability modifier.

18. The method of claim 17 wherein the water-soluble relative permeability modifier is present in the drilling fluid in an amount in the range of from about 0.02% to about 3% by weight of the drilling fluid.

19. A method of reducing the permeability of a subterranean formation to aqueous-based fluids during the drilling phase comprising the steps of:

providing a water-soluble relative permeability modifier that comprises a hydrophilically modified polymer, and

placing the water-soluble relative permeability modifier into the subterranean formation during the drilling phase.

20. The method of claim 19 wherein the hydrophilically modified polymer has a molecular weight in the range of from about 100,000 to about 10,000,000.

21. The method of claim 19 wherein the hydrophilically modified polymer comprises a polymer backbone that comprises polar heteroatoms.

22. The method of claim 21 wherein the polar heteroatoms comprise oxygen, nitrogen, sulfur, or phosphorous.

23. The method of claim 19 wherein the hydrophilically modified polymer is a reaction product of a hydrophilic polymer and a hydrophilic compound.

24. The method of claim 23 wherein the hydrophilic polymer comprises a dialkyl amino pendant group.

25. The method of claim 23 wherein the hydrophilic polymer comprises a dimethyl amino pendant group and at least one monomer comprising dimethylaminoethyl methacrylate or dimethylaminopropyl methacrylamide.

26. The method of claim 23 wherein the hydrophilic polymer comprises a polyvinylamine, a poly(vinylamine/vinyl alcohol), or an alkyl acrylate polymer.

27. The method of claim 23 wherein the hydrophilic polymer comprises polydimethylaminoethyl methacrylate, polydimethylaminopropyl methacrylamide, poly(acrylamide/dimethylaminoethyl methacrylate), poly(acrylic acid/dimethylaminoethyl methacrylate), poly(methacrylic acid/dimethylaminoethyl methacrylate), poly(2-acrylamido-2-methyl propane sulfonic acid/dimethylaminoethyl methacrylate), poly(acrylamide/dimethylaminopropyl methacrylamide), poly(acrylic acid/dimethylaminopropyl methacrylamide), or poly(methacrylic acid/dimethylaminopropyl methacrylamide).

28. The method of claim 23 wherein the hydrophilic polymer comprises a polymer backbone that comprises polar heteroatoms.

29. The method of claim 28 wherein the hydrophilic polymer comprises a cellulose, a chitosan, a polyamide, a polyetheramine, a polyethyleneimine, a polyhydroxyetheramine, a polylysine, a polysulfone, or a starch.

30. The method of claim 22 wherein the hydrophilic compound comprises a polyether comprising halogen; a sulfonate; a sulfate; or an organic acid derivative.

31. The method of claim 30 wherein the polyether comprises a polyethylene oxide, a polypropylene oxide, a polybutylene oxide, or a mixture thereof.

32. The method of claim 30 wherein the polyether comprises an epichlorohydrin terminated polyethylene oxide methyl ether.

33. The method of claim 30 wherein the hydrophilic compound comprises a polyether and the weight ratio of the hydrophilic polymer to the polyether is in the range of from about 1:1 to about 10:1.

34. The method of claim 19 wherein the water-soluble relative permeability modifier is placed into the subterranean formation in a drilling fluid that comprises the water-soluble relative permeability modifier.

35. The method of claim 34 wherein the water-soluble relative permeability modifier is present in the drilling fluid in an amount in the range of from about 0.02% to about 3% by weight of the drilling fluid.

36. A method of reducing the permeability of a subterranean formation to aqueous-based fluids during the drilling phase comprising the steps of:

providing a water-soluble relative permeability modifier comprising a homo-, co-, or terpolymer of acrylamide, 2-acrylamido-2-methyl propane sulfonic acid, N,N-dimethylacrylamide, vinyl pyrrolidone, dimethylaminoethyl methacrylate, acrylic acid, dimethylaminopropylmethacrylamide, vinyl amine, vinyl acetate, trimethylammoniumethyl methacrylate chloride, methacrylamide, hydroxyethyl acrylate, vinyl sulfonic acid, vinyl phosphonic acid, methacrylic acid, vinyl caprolactam, N-vinylformamide, N,N-diallylacetamide, dimethyldiallyl ammonium halide, itaconic acid, styrene sulfonic acid, methacrylamidoethyltrimethyl ammonium halide, a quaternary salt derivative of acrylamide, or a quaternary salt derivative of acrylic acid; and

placing the water-soluble relative permeability modifier into the subterranean formation during the drilling phase.

37. The method of claim 36 wherein the water-soluble relative permeability modifier is placed into the subterranean formation in a drilling fluid that comprises the water-soluble relative permeability modifier.

38. The method of claim 37 wherein the water-soluble relative permeability modifier is present in the drilling fluid in an amount in the range of from about 0.02% to about 3% by weight of the drilling fluid.

39. A method of drilling a well bore in a subterranean formation comprising the steps of:

providing a drilling fluid that comprises:

a base fluid, and

a water-soluble relative permeability modifier that comprises a hydrophobically modified polymer, wherein the hydrophobically modified polymer comprises a polymer backbone that comprises polar heteroatoms; and

placing the drilling fluid in the well bore in the subterranean formation.

40. A method of drilling a well bore in a subterranean formation comprising the steps of:

providing a drilling fluid that comprises:

a base fluid, and

a water soluble relative permeability modifier that comprises a hydrophobically modified polymer, wherein the hydrophobically modified polymer is a reaction product of:

a hydrophilic polymer that comprises a polyvinylamine, a poly(vinylamine/vinyl alcohol), or an alkyl acrylate polymer, and

a hydrophobic compound; and

placing the drilling fluid in the well bore in the subterranean formation.

41. A method of drilling a well bore in a subterranean formation comprising the steps of:

providing a drilling fluid that comprises:

a base fluid, and

a water-soluble relative permeability modifier that comprises a hydrophilically modified polymer; and

placing the drilling fluid in the well bore in the subterranean formation.

42. A drilling fluid for use in drilling a well bore in a subterranean formation comprising:

a base fluid; and

a water-soluble relative permeability modifier that comprises a hydrophobically modified polymer, wherein the hydrophobically modified polymer comprises a polymer backbone that comprises polar heteroatoms.

43. The drilling fluid of claim 42 wherein the hydrophobically modified polymer has a molecular weight in the range of from about 100,000 to about 10,000,000.

44. The drilling fluid of claim 42 wherein the polar heteroatoms comprise oxygen, nitrogen, sulfur, or phosphorous.

45. The drilling fluid of claim 42 wherein the water-soluble relative permeability modifier is present in the drilling fluid in an amount in the range of from about 0.02% to about 3% by weight of the drilling fluid.

46. The drilling fluid of claim 42 wherein the hydrophobically modified polymer is a reaction product of a hydrophobic compound and a hydrophilic polymer that comprises polar heteroatoms within the polymer backbone.

47. The drilling fluid of claim 46 wherein the hydrophilic polymer comprises a cellulose, a chitosan, a polyamide, a polyetheramine, a polyethyleneimine, a polyhydroxyetheramine, a polylysine, a polysulfone, or a starch.

48. The drilling fluid of claim 46 wherein the hydrophobic compound comprises an alkyl halide, a sulfonate, a sulfate, or an organic acid derivative.

49. The drilling fluid of claim 46 wherein the hydrophobic compound has an alkyl chain length in the range of from about 4 to about 22 carbons.

50. A drilling fluid for use in drilling a well bore in a subterranean formation comprising:

a base fluid; and

a water-soluble relative permeability modifier that comprises a hydrophobically modified polymer, wherein the hydrophobically modified polymer is a reaction product of:

a hydrophilic polymer comprising a polyvinylamine, a poly(vinylamine/vinyl alcohol), or an alkyl acrylate polymer, and

a hydrophobic compound.

51. The drilling fluid of claim 50 wherein the water-soluble relative permeability modifier is present in the drilling fluid in an amount in the range of from about 0.02% to about 3% by weight of the drilling fluid.

52. The drilling fluid of claim 50 wherein the hydrophobically modified polymer has a molecular weight in the range of from about 100,000 to about 10,000,000.

53. The drilling fluid of claim 50 wherein the alkyl acrylate polymer comprises polydimethylaminoethyl methacrylate, polydimethylaminopropyl methacrylamide, poly(acrylamide/dimethylaminoethyl methacrylate), poly(acrylic acid/dimethylaminoethyl methacrylate), poly(methacrylic acid/dimethylaminoethyl methacrylate), poly(2-acrylamido-2-methyl propane sulfonic acid/dimethylaminoethyl methacrylate), poly(acrylamide/dimethylaminopropyl methacrylamide), poly(acrylic acid/dimethylaminopropyl methacrylamide), or poly(methacrylic acid/dimethylaminopropyl methacrylamide).

54. The drilling fluid of claim 50 wherein the hydrophobic compound comprises an alkyl halide, a sulfonate, a sulfate, or an organic acid derivative.

55. The drilling fluid of claim 50 wherein the hydrophobic compound has an alkyl chain length of from about 4 to about 22 carbons.

56. A drilling fluid for use in drilling a well bore in a subterranean formation comprising:

a base fluid, and

a water-soluble relative permeability modifier that comprises a hydrophilically modified polymer.

57. The method of claim 56 wherein the water-soluble relative permeability modifier is present in the drilling fluid in an amount in the range of from about 0.02% to about 3% by weight of the drilling fluid.

58. The drilling fluid of claim 56 wherein the hydrophilically modified polymer has a molecular weight in the range of from about 100,000 to about 10,000,000.

59. The drilling fluid of claim 56 wherein the hydrophilically modified polymer comprises a polymer backbone that comprises polar heteroatoms.

60. The drilling fluid of claim 59 wherein the polar heteroatoms within the polymer backbone of the hydrophilically modified polymer comprise oxygen, nitrogen, sulfur, or phosphorous.

61. The drilling fluid of claim 56 wherein the hydrophilically modified polymer is a reaction product of a hydrophilic polymer and a hydrophilic compound.

62. The drilling fluid of claim 61 wherein the hydrophilic polymer comprises a dialkyl amino pendant group.

63. The drilling fluid of claim 61 wherein the hydrophilic polymer comprises a dimethyl amino pendant group and at least one monomer comprising dimethylaminoethyl methacrylate or dimethylaminopropyl methacrylamide.

64. The drilling fluid of claim 61 wherein the hydrophilic polymer comprises a polyvinylamine, a poly(vinylamine/vinyl alcohol), or an alkyl acrylate polymer.

65. The drilling fluid of claim 61 wherein the hydrophilic polymer comprises polydimethylaminoethyl methacrylate, polydimethylaminopropyl methacrylamide, poly(acrylamide/dimethylaminoethyl methacrylate), poly(acrylic acid/dimethylaminoethyl methacrylate), poly(methacrylic acid/dimethylaminoethyl methacrylate), poly(2-acrylamido-2-methyl propane sulfonic acid/dimethylaminoethyl methacrylate), poly(acrylamide/dimethylaminopropyl methacrylamide), poly(acrylic acid/dimethylaminopropyl methacrylamide), or poly(methacrylic acid/dimethylaminopropyl methacrylamide).

66. The drilling fluid of claim 61 wherein the hydrophilic polymer comprises a polymer backbone that comprises polar heteroatoms.

67. The drilling fluid of claim 66 wherein the hydrophilic polymer comprises a cellulose, a chitosan, a polyamide, a polyetheramine, a polyethyleneimine, a polyhydroxyetheramine, a polylysine, a polysulfone, or a starch.

68. The drilling fluid of claim 61 wherein the hydrophilic compound comprises a polyether comprising halogen; a sulfonate; a sulfate; or an organic acid derivative.